IT IS CLAIMED:

1. A microphone system comprising:

a plurality of colinear microphones regularly spaced according to a plurality of distinct spacings with a common center;

a plurality of microphone signal adders, wherein the microphones of each set of microphones having one of said spacings are connected to the same signal adder;

a plurality of first filters, each connected to receive the output of a corresponding one of the microphones signal adders; and

an output adder connected to receive the output of the first filters and supply the combined signal as an output, wherein the frequency response of the first filters is such that the combined signal is flat over a selected frequency range in a selected direction.

2. The microphone system of claim 1, further comprising:

a plurality of second filters, wherein each of the connections of one of the microphones to one of the microphone signal adders is made through one of the second filters.

3. The microphone system of claim 2, wherein the second filters implement windowing functions.

4. The microphone system of claim 2, wherein the windowing functions are Kaiser-Bessel window functions.

5. The microphone system of claim 2, wherein the second filters implement a delay.

6. The microphone system of claim 5, wherein the delay of a given second filter is proportional to the spacing of the set of microphones to which the

microphone it belongs corresponds, and wherein all the second filters depend upon the same function of a steering angle.

7. The microphone system of claim 1, wherein the frequency response of each of the first filters is a continuous function of frequency, the response of the first filter corresponding to the smallest spacing being zero below a first frequency, constant above a second frequency and linear between the first and second frequency, the response of the first filter corresponding to the largest spacing being zero above a third frequency, constant below a fourth frequency and linear between the third and fourth frequency, and wherein for each of the other first filters, the response is zero outside of a respective frequency range and inside the respective frequency range linearly increasing below a respective intermediate frequency and linearly decreasing above the respective intermediate frequency.

8. The microphone system of claim 1, wherein the selected frequency range is greater than five octaves.

9. The microphone system of claim 1, wherein the selected frequency range is from 20 hertz to 20 kilohertz.

10. The microphone system of claim 1, wherein the number of spacings is N and the spacings are $2^{(i-1)}d$, where i runs from one to N and d is the smallest spacing.

11. The microphone system of claim 10, wherein N is equal to nine.

12. The microphone system of claim 10, wherein d is in a range of 0.5 centimeters to ten centimeter.

13. The microphone system of claim 10, wherein the number of microphones corresponding to each of the spacings is three or more.

14. The microphone system of claim 13, wherein a microphone belongs to a plurality of the sets of microphones having one of said spacings.

15. The microphone system of claim 1, further comprising:

a second plurality of microphone signal adders, wherein the microphones of each set of microphones having one of said spacings are connected to the same second signal adder;

a second plurality of first filters, each connected to receive the output of a corresponding one of the second microphones signal adders; and

an second output adder connected to receive the output of the second plurality of first filters and supply the combined signal as a second output, wherein the frequency response of the second plurality of first filters is such that the combined signal is flat over a selected frequency range in a second selected direction.

16. A microphone system comprising:

a planar array of a plurality of microphones regularly spaced in the direction of a first axis according to a plurality of first spacings centered on a second axis and regularly spaced in the direction of the second axis according to a plurality of second spacings centered on the first axis, wherein the axes are nondegenerate;

a plurality of microphone signal adders, wherein the microphones of each set of microphones forming a line having one of said spacings parallel to one of said axes are connected to the same adder;

a plurality of first filters, each connected to receive the output of a corresponding one of the microphones signal adders; and

an output adder connected to receive the output of the filters and supply the combined signal as an output.

17. The microphone system of claim 16, further comprising:

a plurality of second filters, wherein each of the connections of one of the microphones to one of the microphone signal adders is made through one of the second filters.

18. The microphone system of claim 17, wherein the second filters implement windowing functions.

19. The microphone system of claim 17, wherein the windowing functions are Kaiser-Bessel window functions.

20. The microphone system of claim 17, wherein the second filters implement a delay.

21. The microphone system of claim 20, wherein the delay of a given second filter is proportional to the spacing of the set of microphones to which the microphone it belongs corresponds, and wherein all the second filters depend upon the same function of a set of steering angle.

22. The microphone system of claim 16, wherein the frequency response of each of the first filters is a continuous function of frequency, the response of the first filter corresponding to the smallest spacing being zero below a first frequency, constant above a second frequency and linear between the first and second frequency, the response of the first filter corresponding to the largest spacing being zero above a third frequency, constant below a fourth frequency and linear between the third and fourth frequency, and wherein for each of the other first filters, the response is zero outside of a respective frequency range and inside the respective frequency range linearly increasing below a respective intermediate frequency and linearly decreasing above the respective intermediate frequency.

23. The microphone system of claim 16, wherein the selected frequency range is greater than five octaves.

24. The microphone system of claim 16, wherein the selected frequency range is from 20 hertz to 20 kilohertz.

25. The microphone system of claim 16, wherein the number of first spacings is N_1 and the first spacings are $2^{(i-1)}d_1$, where i runs from one to N_1 and d_1 is the smallest spacing in the direction of the first axis, and , wherein the number of second spacings is N_2 and the second spacings are $2^{(j-1)}d_2$, where j runs from one to N_2 and d_2 is the smallest spacing in the direction of the second axis.

26. The microphone system of claim 25, wherein N_1 and N_2 are equal to nine.

27. The microphone system of claim 25, wherein d_1 and d_2 are in a range of 0.5 centimeters to ten centimeter.

28. The microphone system of claim 25, wherein the number of microphones corresponding to each of the first and second spacings is three or more.

29. The microphone system of claim 28, wherein a microphone belongs to a plurality of the sets of microphones having one of said spacings.

30. The microphone system of claim 25, wherein d_1 is equal to d_2.

31. The microphone system of claim 16, wherein the axes are orthogonal.

32. The microphone system of claim 16, wherein the axes are orthogonal.

33. A microphone system comprising a number of the microphone systems of claim 16, wherein the planar arrays are non-coplanar and the number is two or more.

34. The microphone system of claim 33 wherein number is two, wherein the planar arrays are orthogonal, and wherein the axes in the planar arrays are orthogonal.

35. A method of providing a directional response to a sonic input that is flat over a frequency range, comprising:

receiving the sonic input at a plurality of microphones, wherein the microphones are arranged according to a plurality of distinct regular spacings;

for each of the spacings, combining the responses of the corresponding microphones to the sonic input;

filtering each of the combined responses with a frequency response dependent upon the respective spacing; and

combining the filtered responses, where the frequency responses of the filters is such that the combined output is flat over the frequency range in a selected direction.

36. The method of claim 35, further comprising:

filtering the responses of the microphones with windowing filters prior to combing the responses.

37. The method of claim 36, wherein the windowing filters are Kaiser-Bessel window filters.

38. The method of claim 35, further comprising:

selecting a direction;

causing the delay of the responses of the microphones prior to combing the responses, whereby directional response to the audio signal is peaked in the selected direction.

39. The method of claim 35, wherein the frequency range is greater than five octaves.

40. The method of claim 35, wherein the frequency range is from 20 hertz to 20 kilohertz.

41 A method of providing a directional audio response that is flat over a frequency range, comprising:

providing a plurality of microphones;

arranging the microphones according to a plurality of distinct regular spacings;

combining the outputs of the microphones of each spacing to provide a respective combined signal for that spacing;

filtering each of the combined outputs according to a respective frequency response; and

combining the filtered combined outputs, where the spacings and the respective filter responses are related such that the combined filtered output is flat over the frequency range.

42. The method of claim 41, wherein the microphones are arranged colinearly and the distinct spacings share a common center.

43. The method of claim 42, wherein the number of spacings is N and the spacings are $2^{(i-1)}d$, where i runs from one to N and d is the smallest spacing.

44. The method of claim 43, wherein N is equal to nine.

45. The method of claim 43, wherein d is in a range of 0.5 centimeters to ten centimeter.

46. The method of claim 43, wherein the number of microphones corresponding to each of the spacings is three or more.

47. The method of claim 41, further comprising:

filtering the outputs of the microphones with windowing filters prior to combing the outputs of the microphones.

48. The method of claim 47, wherein the windowing filters are Kaiser-Bessel window filters.

49 The method of claim 41, further comprising:

delaying outputs of the microphones prior to combing the outputs of the microphones, whereby audio response is peaked in a selected direction.

50. The method of claim 49 wherein the delay is proportional to the spacing of the set of microphones to which the microphone it belongs corresponds, and wherein all the second filters depend upon the same function of a steering angle.

51. The method of claim 41, wherein the respective frequency response corresponding to the smallest spacing is zero below a first frequency, constant above a second frequency and linear between the first and second frequency, wherein the respective frequency response corresponding to the largest spacing is zero above a third frequency, constant below a fourth frequency and linear between the third and fourth frequency, and wherein the respective frequency response corresponding to the other spacings is zero outside of a respective frequency range and inside the respective frequency range linearly increasing below a respective intermediate frequency and linearly decreasing above the respective intermediate frequency.

52. The method of claim 41, wherein the selected frequency range is greater than five octaves.

53. The method of claim 41, wherein the selected frequency range is from 20 hertz to 20 kilohertz.

54. The method of claim 41, wherein the microphones are arranged in one or more planar arrays, the microphones of each planar array being regularly spaced in the direction of a first axis according to a plurality of first spacings centered on a second axis and regularly spaced in the direction of the second axis according to a plurality of second spacings centered on the first axis, wherein the axes of each planar array are nondegenerate and the planar arrays are nondegenerate.

55. A method of providing an audio signal comprising:

causing to be provided a plurality of signals from an array of microphones arranged according to a plurality of regular spacings;

providing a direction;

delaying the signals within each spacing relative to each other;

combining the delayed signals within of each spacing, wherein the delays are such that the combined signal of each spacing has a directional response centered at the direction;

filtering the combined signals according to a respective filter response; and

combining the filtered combined signals, where the spacings and the filter responses are related such that the combined filtered output is flat over the frequency range.

56. The method of claim 55, wherein the plurality of signals from an array of microphones are provided from a pre-recording of said signals.